Tektronix

VM700*T (turbo)* Video Measurement Set Option 11 PAL Video Measurements

Many capabilities in one instrument
- **Digitizing waveform monitor**
- **Digitizing vectorscope**
- **Picture Display**
- **Group delay and frequency response**
- **Noise measurement set**
- **Automatic measurement set**

Auto mode
- **Unattended monitoring of PAL video signals from studios, STLs, Earth Stations, and transmitters**
- **User-specified limits**

Measure mode provides graphic display of measurements
- **ICPM**
- **K factor**
- **Differential gain and phase**
- **Chrominance to luminance delay**
- **Noise spectrum**
- **Group delay with sin x/x**
- **Color bars**
- **Relative to reference on most measurements**
- **Configurable for all standard test signals**

Award winning user interface

State-of-the-art architecture

Extremely fast update rate

Parallel and serial printer ports

Three input channels

Channel difference modes

External VGA display port

Fully documented remote control operation

Hardcopy for analysis and documentation

Recognized with eight technical Emmy awards and one Oscar for outstanding contributions to the television industry, Tektronix world class core competencies have enabled it to design and deliver the most comprehensive solutions in the industry.

The VM700T is a product of this core competency. Recognized as the defacto industry standard that keeps pace with evolving customer needs, the VM700T is a total solution for your baseband video and audio[1] monitoring and measurement needs. Features such as an extremely fast and fully automatic measurement mode as well as full manual operation provides the first time user as well as the seasoned professional an unequaled value for their test and measurement investment.

Automatic video measurement set

The VM700T Auto mode makes standard video transmitter measurements quickly and automatically, including those specified in CCIR Rep. 624-1, Rec. 567, and Rec. 569. Both vertical interval and full field measurements can be made and compared with user-defined limits. A dual limit verification system is employed to generate a caution or alarm message when either limit is violated. Reports can be generated and printed automatically at operator scheduled times or triggered from a conditional event.

Graphic displays of measurements

Measure mode provides virtual real time graphic displays of measurement results automatically. Vertical interval or full field measurements including noise spectrum, group delay, K-factor, differential gain and differential phase are presented as clever, easy to understand interactive digital displays. Such displays are indispensable when extremely fast measurement update rates (up to 30 times a second) are required to provide instant feedback of critical adjustments and analysis of signal variations. User definable limits are visually integrated into each graphic display and can be used to trigger a measurement report or a user definable macro function. Such a function can, for example, dial out through a

[1] Option 40 audio measurement package.

modem to report measurement results or control a signal router. A relative to reference mode allows normalizing to a signal source or eliminate signal path errors from the desired measurement. Up to 2 video references can be stored in NVRAM. Additionally, after downloading to a PC through the VM700T FTP driver, the video reference can be uploaded to another VM700T for reuse. A running averaging mode can be used to reduce the effect of noise. When additional measurement data is required a user can custom configure measurement parameters and report format.

A powerful Test Signal search capability quickly and automatically locates and identifies valid test signals required for a selected measurement, eliminating the annoying and time consuming task of manually locating test signals.

Digital waveform monitor/ vectorscope

The VM700T Waveform mode application provides real time graphics displays of the video signal allowing many additional measurements to be made manually. Easy to use measurement cursors are available to measure time, frequency and amplitude parameters of a video signal. These cursors allow a very quick and precise location of the 10%, 50% and 90% points on any transition. Cursor mode also employs an automatic calculation in the wave shape in the center of the display. The parameters calculated are sine peak-to-peak amplitude, frequency, and offset from blanking level. This is very useful for frequency response measurements with the Multiburst signal.

The waveform display can be expanded around any point both vertically and horizontally. Since the data is digitized, the display remains bright and easy to ready at all expansion factors. The scales automatically expand with the waveform, so all units are correct as displayed. A channel difference mode (A-B, A-C, B-A, B-C, C-A, and C-B) is also provided. A screen memory selection enables Envelope mode, which is useful for looking at teletext, Jitter, or other changes over time.

Vector mode provides the normal vectorscope display. The vectors may be rotated or expanded, with the rotation angle and gain values displayed numerically on the screen.

A unique "Find ColorBars" feature searches all video for ColorBars and displays the vectors if found. The vectors can be referenced to either the selected channel's burst or the burst of one of the other two channels or continuous subcarrier. The phase difference between the selected channel and the reference is always displayed.

Select Line in both Waveform and Vector modes can be used to quickly specify any line for display or automatic measurement if it is the proper signal.

Picture mode

The signal source can be quickly verified using the picture display. Additionally, a "bright-up" line select mode allows a user to select any video line for use in Measure mode or for viewing in Waveform or Vector mode.

User programmable functions

Function mode is an extremely powerful feature that allows a user to store a sequence of user operations as a macro function for later "playback."

For example, a set of measurements (complete with hardcopy commands) to be made on a transmitter demodulator video output, could be stored as a function labeled "DEMOD." The function "playback" could then be initiated manually, remotely or completely automatically as a user specified timed event. Function files can be stored as a text file on a PC for editing, copying or uploading to another VM700T. Other function capabilities include controlling of external serial devices such as video/audio routers, switchers, signal generators, telephone modems and many other devices which support RS232 communications.

Hardcopy

All information on the screen may be printed in high resolution graphics on printers supporting PostScript®, Hewlett-Packard® LaserJet™, DeskJet™, and ThinkJet™, or 24-pin Epson® graphics via the Centronics compatible parallel port or standard RS-232C interface.

Automatic measurement results in text format can be printed on most ASCII printers using the parallel or serial ports.

Remote Operation

The VM700T has a powerful and fully documented remote control language. The VM700T can thus be operated from a remote terminal via RS-232C to monitor unattended transmission systems. In addition, all files can be uploaded to a main computer, and downloaded to other VM700Ts. Two different protocols are supported: FTP (File Transfer Protocol) and TELNET. The user can also select a "no protocol" mode of the RS-232C interface when dealing with low baud rates. However, file transfers can only take place with FTP.

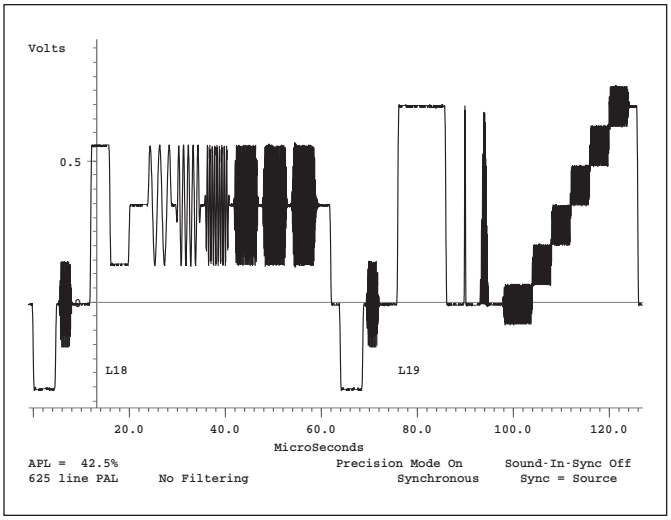
Specifications

The performance requirements cited in this section are valid only within the following environmental limits:

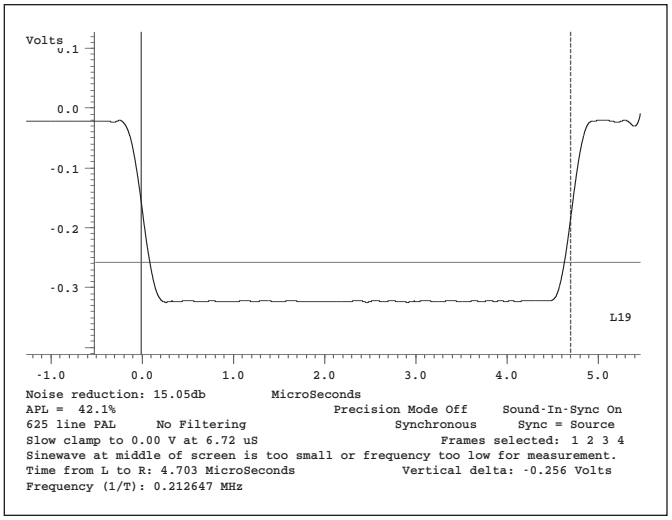
Temperature range of 0 to 50 degrees Celsius, with a minimum warm-up time of 20 minutes. The following tables list each measurement and its performance requirement.

The range specifies the extremes between which a measurement can be made.

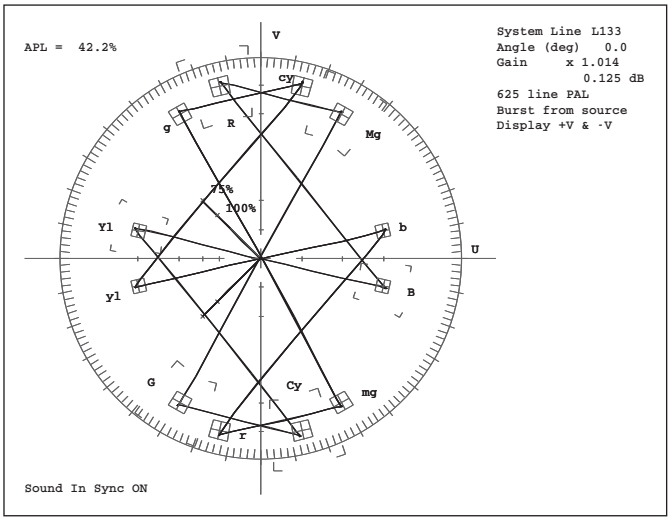
All measurement accuracies specified are valid only with nominal input signals of 1 volt pk-pk (± 6 dB) with an unweighted signal-to-noise ratio of at least 60 dB on the incoming signal and a termination accuracy of ± 0.025% (Tektronix PN 011-0102-01 or equivalent).



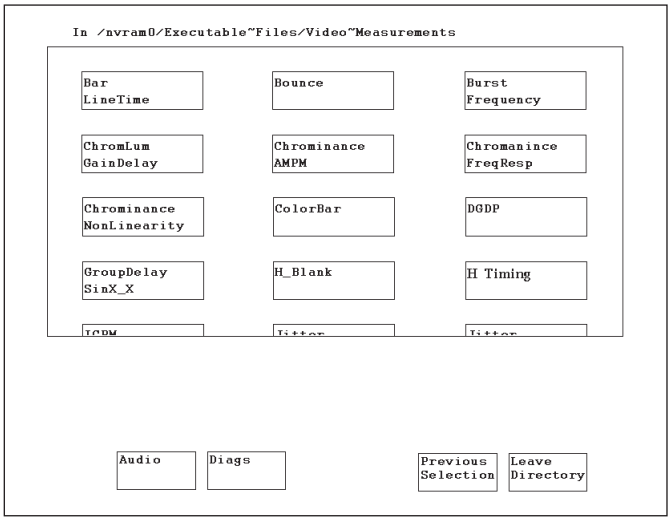
Vertical interval test signals can be seen very clearly for additional analysis of the signal. These can be printed as support documentation for automatic measurement results.



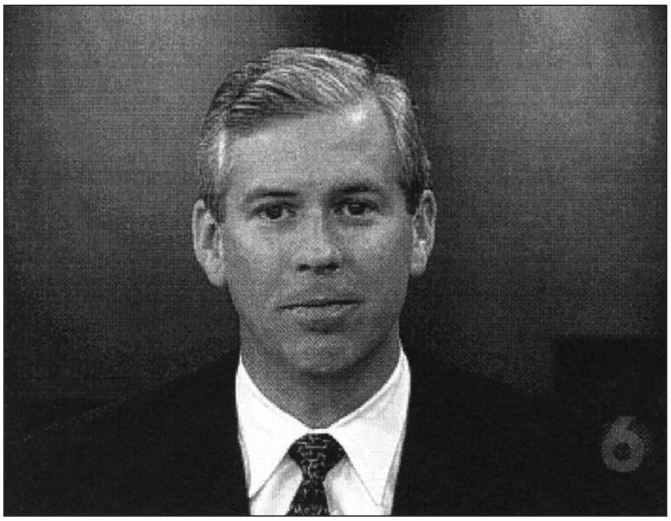
Even a single horizontal synchronization pulse can be displayed at a high intensity.



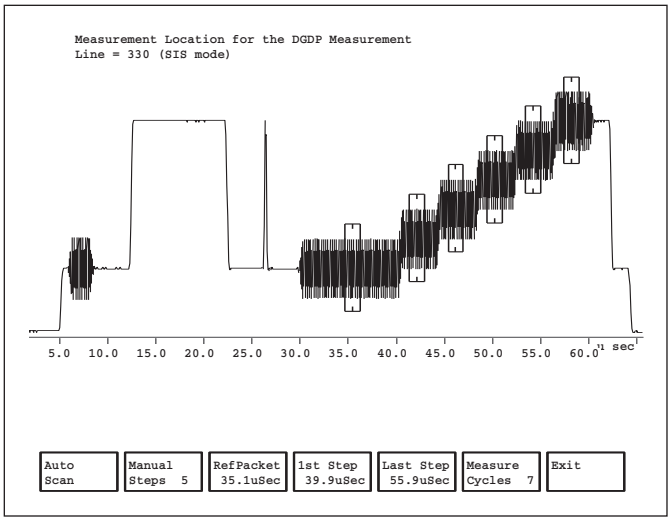
In Vector Mode, the VM700T becomes a digital vectorscope with an electronic graticule. The "Color Bar Search" feature makes it easy to quickly display a line containing a color bar test signal.



Main Measure Mode display of available measurements.



Picture Mode display. (Video courtesy of KOIN-TV, Portland, Oregon.)

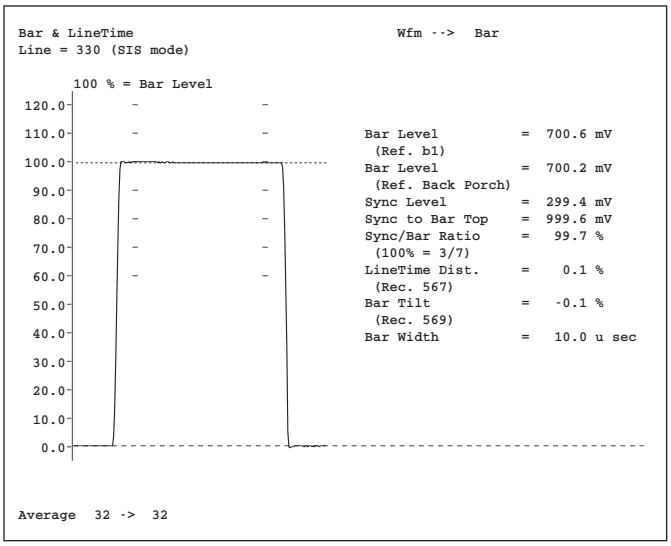


Measure Mode DGDP special position acquisition feature.

MEASURE MODE[1,2]

BAR LINE TIME

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Bar Level (b1 or Back Porch)	300 mV to 1.4 V	± 0.5%	± 0.2%
Sync Level	50 mV to 600 mV	± 0.5%	± 0.2%
Sync to Bar Top	350 mV to 2 V	± 0.5%	± 0.2%
Sync/Bar Ratio	10% to 125% 100% nominal	± 0.5%	± 0.2%
Bar Tilt (Rec 569)	0 to 20%	± 0.2%	± 0.1%
Line Time Distortion (Rec 567)	0 to 20%	± 0.2%	± 0.1%
Bar Width	10 µS to 30 µS	± 100 nS	NA



Bar Line Time measurement.

BOUNCE

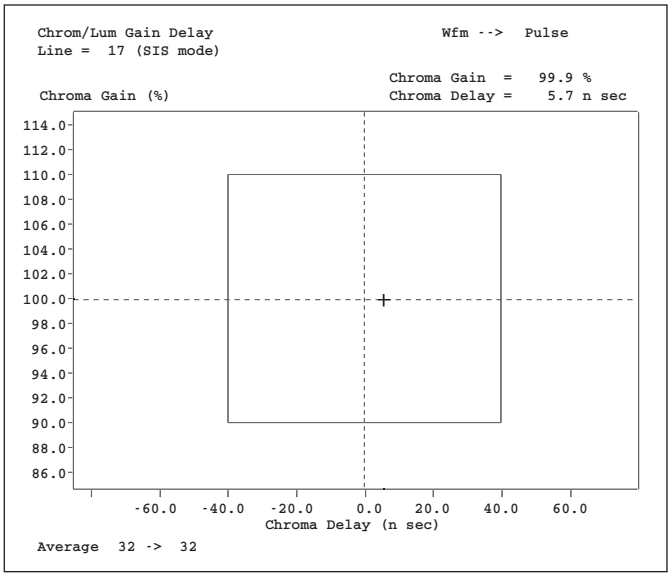
Measurement	Range	Accuracy
Peak Deviation	0 to 50%	± 1%
Settling Time	0 to 10 sec	± 100 msec

BURST FREQUENCY[3]

Measurement	Range	Relative Mode Accuracy
Burst Frequency Error	± 100 Hz	± 0.5 Hz

CHROMINANCE TO LUMINANCE

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Chrominance to Luminance Delay	± 300 ns	± 5 ns	± 1.0 ns
Chrominance to Luminance Gain Ratio	0 to 160%	± 1.0%	± 0.1%



Chrominance to Luminance Gain and Delay measurement.

CHROMINANCE NOISE

Measurement	Range	Absolute Mode Accuracy
AM Noise	–20 to –80 dB	± 1 dB (–20 to –60 dB)
PM Noise	–20 to –70 dB	± 1 dB (–20 to –60 dB)

[1] All accuracies for measurements with averaging capabilities assume the default average of 32.

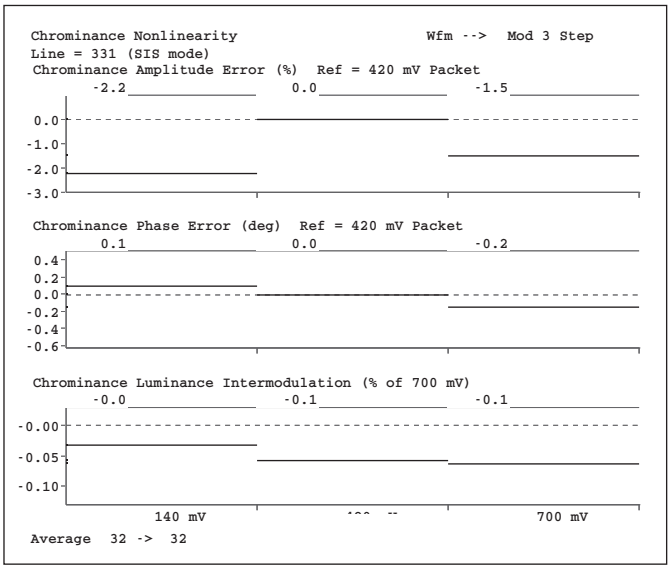
[2] All accuracies for measurements with relative to reference mode assume an average of 256 was used to create the reference.

[3] Requires a reference signal.

MEASURE MODE (continued)

CHROMINANCE NON-LINEARITY[4]

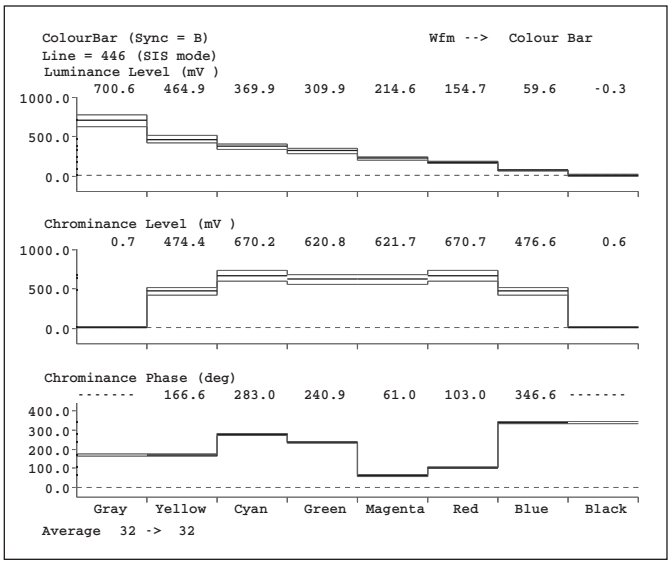
Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Chrominance Amplitude	0 to 100%	± 0.4%	± 0.2%
Chrominance Phase	0 to 360 deg	± 1 deg	± 0.2 deg
Chrominance to Luminance Intermodulation	–50 to +50%	± 0.2%	± 0.2%



Chrominance Non-Linearity measurement.

COLOR BAR

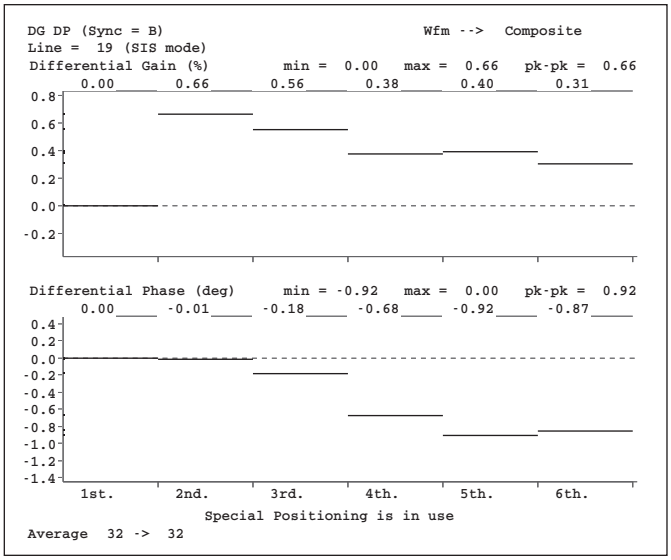
Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Luminance Level	0 to 700 mV	± 3.5 mV	± 0.2%
Chrominance Level (excluding gray and black)	0 to 700 mV	± 1.0% of nominal	± 0.2%
Chrominance Phase	± 180 deg	± 0.5 deg	± 0.1 deg



Color Bar measurement.

DIFFERENTIAL GAIN AND PHASE

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Differential Gain (Minimum, Maximum, and Peak)	0 to 100%	± 0.3%	± 0.03%
Differential Phase (Minimum, Maximum, and Peak)	0 to 360 deg	± 0.3 deg	± 0.03 deg



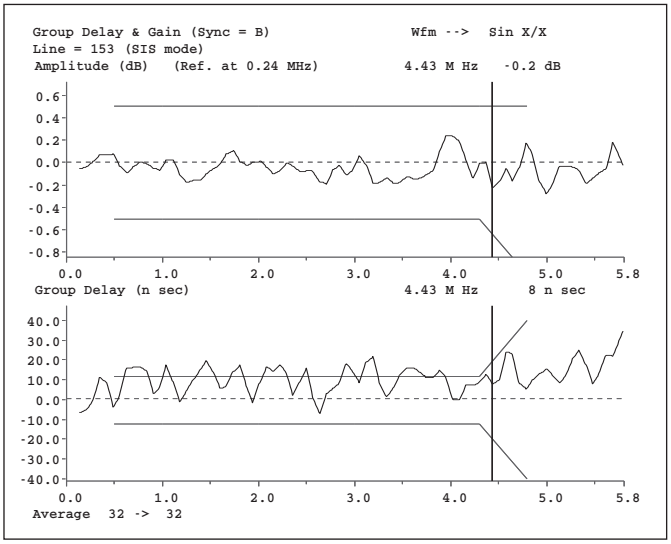
Differential Gain and Phase measurement.

[4] Accuracies for chrominance non-linearity amplitude and phase measurements assume an average of 256.

MEASURE MODE (continued)

FREQUENCY RESPONSE AND GROUP DELAY

Measurement	Absolute Range Accuracy	Relative Mode Accuracy	Mode
Frequency Response			
to 5 MHz	± 40 dB	± 1.0 dB	± 0.3 dB
to 6 MHz	± 40 dB	± 2.0 dB	± 0.6 dB
Group Delay			
to 5 MHz	± 1.0 µs	± 20 ns	± 5 ns
to 6 MHz	± 1.0 µs	± 40 ns	± 10 ns



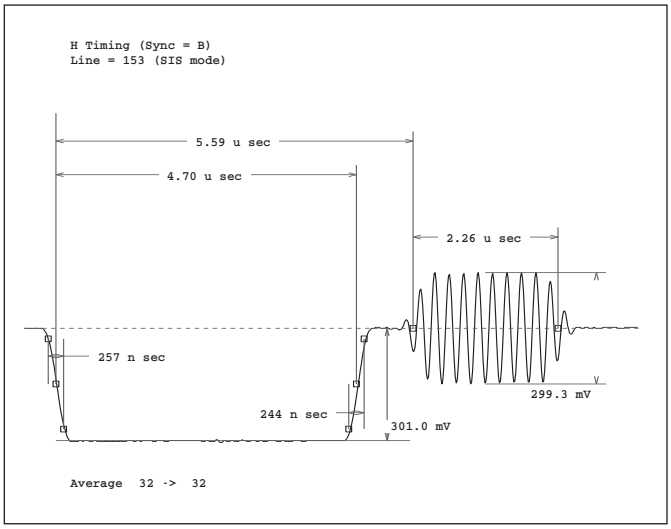
Frequency Response and Group Delay measurement using Sin X/X.

HORIZONTAL BLANKING

Measurement	Range	Absolute Mode Accuracy
Blanking Start	0.1 to 4.2 µs	± 50 ns
Blanking End	6.8 to 12.2 µs	± 50 ns
Blanking Width	6.9 to 16.4 µs	± 50 ns

HORIZONTAL TIMING

Measurement	Range	Absolute Mode Accuracy
Burst Level	80 to 600 mV	± 1%
Horizontal Sync Rise and Fall Time	80 ns to 1 µs	± 10 ns
Horizontal Sync Width	1 to 8 µs	± 10 ns
Burst Width	1.4 to 3 µs	± 25 ns
Sync to Burst Start	5 to 8 µs	± 25 ns
Sync Level	75 to 600 mV	± 0.5%



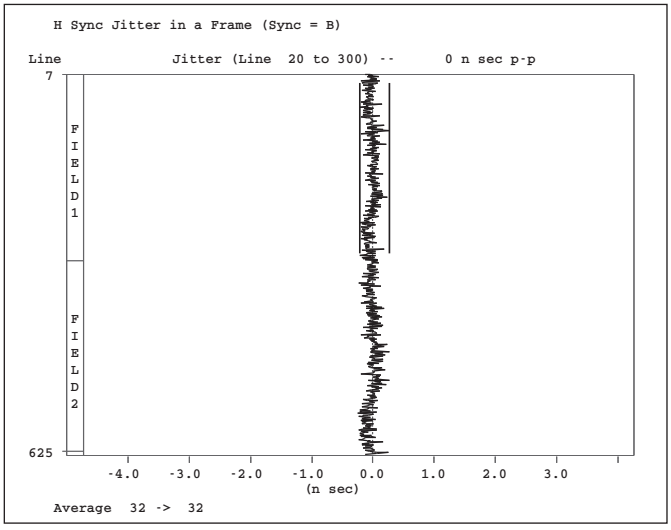
Horizontal Timing measurement.

INCIDENTAL CARRIER PHASE MODULATION

Measurement	Range	Accuracy
ICPM (requires zero Carrier Pulse and the quadrature output of the demodulator on Channel C)	0 to 90 deg	± 1.0 deg

JITTER

Measurement	Range	Absolute Mode Accuracy
Jitter (2 Field)	± 20 µs	± 10 ns
Jitter Long Time	± 20 µs	± 10 ns

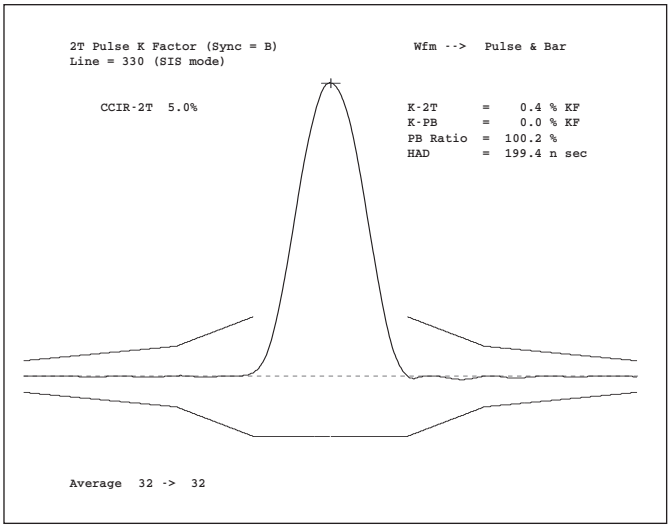


H_Jitter.

MEASURE MODE (continued)

K-FACTOR

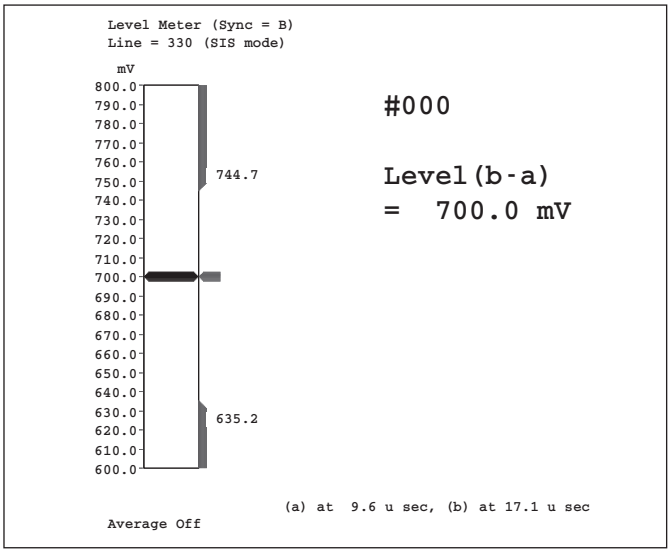
Measurement	Range	Absolute Mode Accuracy
2T Pulse K-Factor	0 to 10% Kf	± 0.3%
KPB	–10 to +5% KPB	± 0.3%
Pulse to Bar Ratio	10 to 125%	± 0.7%
Pulse Half Amplitude Duration (HAD)	100 to 500 ns	± 5 ns



K-factor measurement.

LEVEL METER

Measurement	Range	Accuracy
Level Meter	0 to 1.4 V	± 3.5 mV



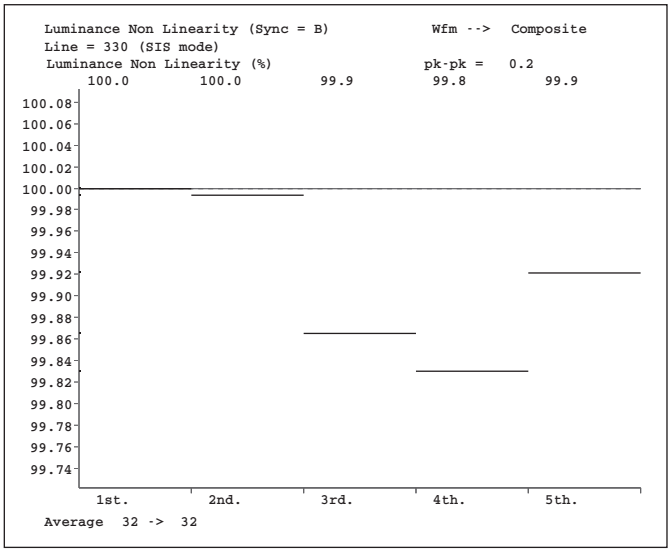
Level Meter measurement.

LINE FREQUENCY

Measurement	Range	Accuracy
Line Frequency	± 3%	± 0.1%
Field Frequency	± 3%	± 0.1%

LUMINANCE NON-LINEARITY

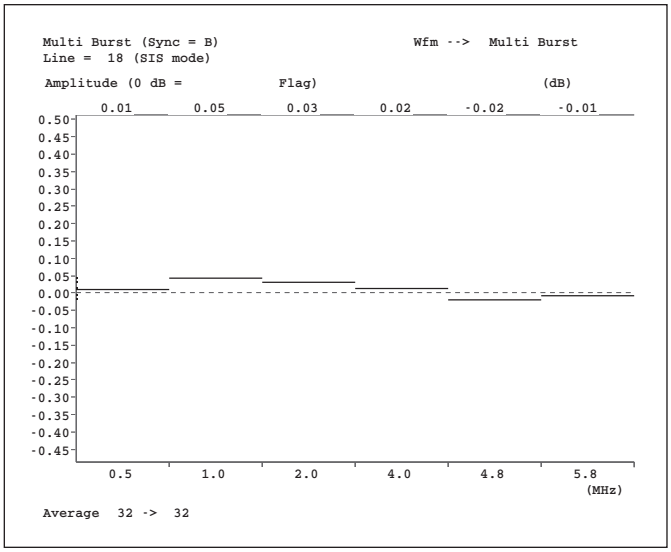
Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Luminance Non-Linearity	0 to 100%	± 0.4%	± 0.2%



Luminance Non-Linearity measurement.

MULTIBURST[5]

Measurement	Range	Absolute Mode Accuracy	Relative Mode Accuracy
Multiburst Flag Amplitude	0 to 700 mV	± 0.5%	NA
Packets 1-5 (0.5, 1.0, 2.0, 4.0, 4.8 MHz)	–40 to +6 dB	± 0.1 dB	± 0.03 dB
Packet 6 (5.8 MHz)	–40 to +6 dB	± 0.2 dB	± 0.06 dB



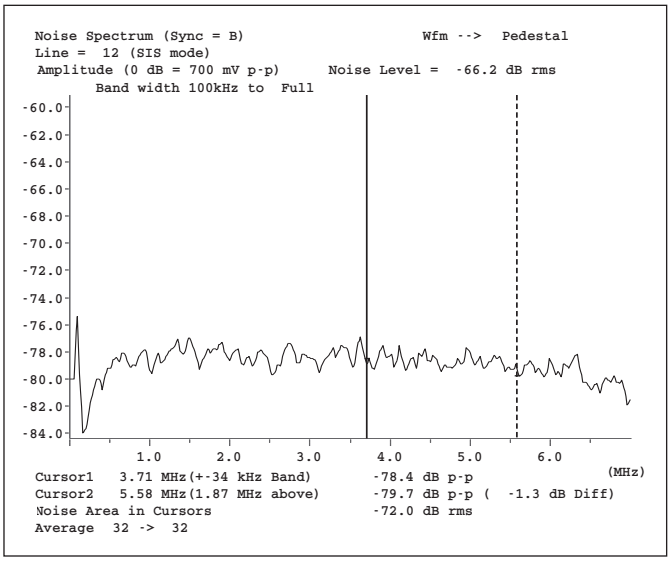
Multiburst measurement.

[5] Total Harmonic Distortion on packets must be ≤46 dB.

MEASURE MODE (continued)

NOISE SPECTRUM

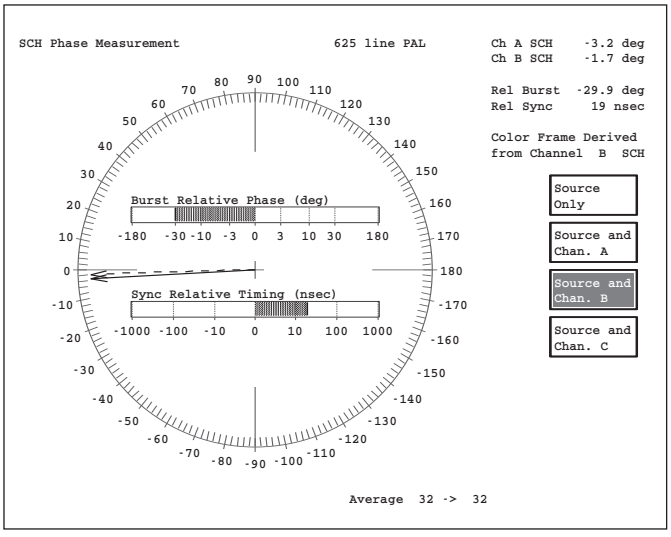
Measurement	Range	Absolute Mode Accuracy
Unweighted Signal-to-Noise (5 MHz Low Pass)	–20 to –80 dB	± 0.4 dB (–20 to –60 dB) ± 1.0 dB (–60 to –70 dB)
Luminance Weighted Signal-to-Noise (5 MHz Low Pass and Unified Weighting)	–20 to –80 dB	± 1.0 dB (–20 to –60 dB) ± 2.0 dB (–60 to –70 dB)
Chrominance Weighted Signal-to-Noise	–20 to –80 dB	± 1.0 dB (–20 to –60 dB) ± 2.0 dB (–60 to –70 dB)



Noise Spectrum measurement.

SCH PHASE

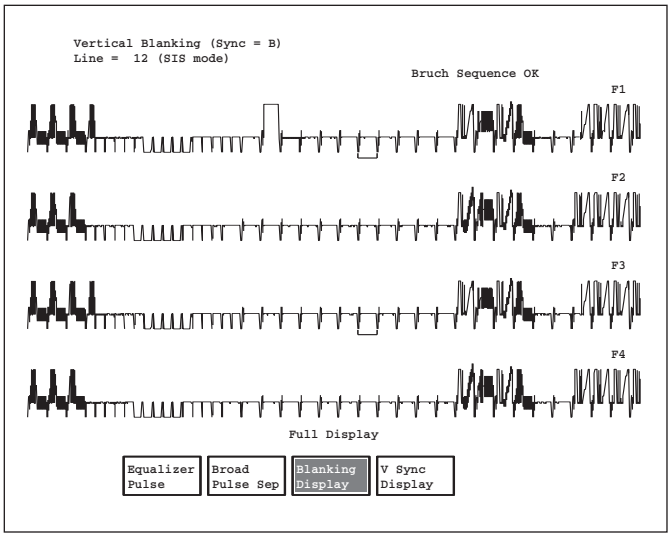
Measurement	Range	Absolute Mode Accuracy
SCH Phase	± 90 deg	± 5 deg
Sync Timing	± 1 µS	± 10 nS
Burst Timing	± 180 deg	± 5 deg



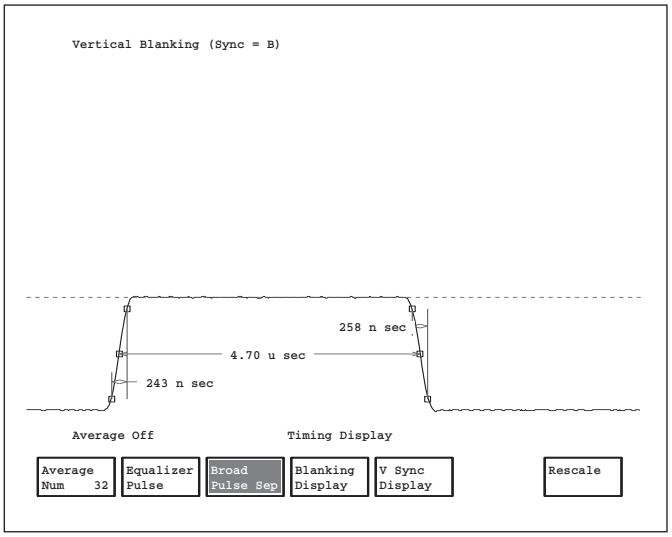
SCH Phase measurement.

VERTICAL BLANKING

Measurement	Range	Absolute Mode Accuracy
Equalizing Pulse Width	80 ns to 1 µs	± 10 ns
Broad Pulse Width	80 ns to 1 µs	± 10 ns
Vertical Blanking Field 1	19 to 30 lines	NA
Vertical Blanking Field 2	19 to 30 lines	NA



Vertical Blanking display.



Vertical Blanking Serration Pulse measurement.

AUTO MODE

LINE BLANKING TIMING MEASUREMENTS

These measurements are all made on samples acquired from the live signal area. With the exception of Line Sync Rise Time and Fall Time, these measurements are made in accordance with CCIR Report 624-1.

Measurement	Range	Accuracy
Color Burst Duration	6 to 13 cycles (10 cycles nominal)	± 0.1 cycle
Front Porch Duration	0.5 to 3 µs (1.5 µsnominal)	± 20 ns
Line Blanking	9 to 16 µs (12 µsnominal)	± 50 ns
Line Sync Rise and Fall Times	120 to 300 ns 300 ns to 1 µs	±15 ns ± 30 ns
Line Sync	1.4 to 6.6 µs (4.7 µs nominal)	± 10 ns
Sync-to-Start of Burst	2.2 to 8 µs (5.6 µs nominal)	± 20 ns
Burst Duration	1.4 to 3 µs	± 25 ns
SCH Phase	± 90 deg	± 5 deg

FIELD BLANKING TIMING MEASUREMENTS

Measurement	Range	Accuracy
Equalizing Pulse Duration	1.4 to 20 µs (2.35 µs nominal)	± 10 ns
Broad Pulse Separation	1.4 to 20 µs (4.7 µs nominal)	± 10 ns

OTHER TIMING MEASUREMENTS

Measurement	Range	Accuracy	ITS Element	Standard
Bar Rise Time	120 to 300 ns 0.3 to 1.0 µs	± 20 ns ± 30 ns	B2	Measured from 10% to 90% points

AMPLITUDE AND PHASE MEASUREMENTS

Measurement	Range	Accuracy	ITS Element	Standard
Average Picture Level	0 to 200%	± 3%		
Sync Amplitude Error	+100 to –50% (300 mV nominal)	± 0.5% of nominal	Live picture area	CCIR Rec. 569
Sync Amplitude Error (with Sound-in-Sync)	+100 to –50% (300 mV nominal)	± 0.3% of nominal	Last broad pulse in field	CCIR Rec. 569
Burst Amplitude Error	+80 to –50% (300 mV nominal)	± 1.0%	Live picture area	CCIR Rec. 569
Chrominance Reference Amplitude Error	–80 to +50% (300 mV nominal)	± 1.0%	D2	CCIR Rec. 569
Luminance Bar Amplitude Error	+30 to –70% (700 mV nominal)	± 0.3%	B2	CCIR Rec. 569
Luminance Bar Amplitude	200 to 900 mV	± 2.2 mV	B2	
Luminance Bar Amplitude (% of carrier)	0 to 90% of Maximum Carrier	± 0.3%	B2 and Zero Carrier	
Residual Carrier (Bar Top)	0 to 90% of Maximum Carrier	± 0.3%	B2 and Zero Carrier	
Blanking Level	0 to 90% of Zero Carrier	± 0.2%	Live picture area	CCIR Rep. 624-1
Chrominance-Luminance Gain Inequality	± 75% of bar amplitude	± 1.0%	G1 or G2	CCIR Rec. 569
Chrominance-Luminance Delay Inequality	± 300 ns (0 ns nominal)	± 5 ns	F or G1 or G2	CCIR Rec. 569
Sync/Bar Rel. 3/7	20 to 110%	± 0.5%	B2	CCIR Rec. 569
Sync to Bar Top	0.5 to 2 V	± 0.5%	B2	CCIR Rec. 569
C/L Gn Err (using modulated Pulse)	± 50%	± 1%	F	
Sync Amplitude	75 to 600 mV	± 1.5 mV		
Burst Amplitude	75 to 600 mV	± 3 mV		
Burst Amplitude Difference		± 2%		
Burst Quadrature Error		± 1 deg		

AMPLITUDE AND PHASE MEASUREMENTS (continued)

Measurement	Range	Accuracy	ITS Element	Standard
Differential Gain (Peak and p-p)	0 to +100% (0% nominal)	± 0.3%	D2	CCIR Rec. 569
Differential Phase (Peak and p-p)	0 to 360 deg (0 deg nominal)	± 0.3 deg	D2	CCIR Rec. 569

FREQUENCY RESPONSE MEASUREMENTS

Measurement	Range	Accuracy	ITS Element	Standard
Multiburst Flag Amplitude	20 to 130% of bar (60% nominal)	± 0.5%	C1	CCIR Rec. 567
Multiburst Amplitude	0 to 200% of flag (100% nominal)	± 1.5% of flag (± 2.5% of 5.8 MHz packet)	C2	CCIR Rec. 567

WAVEFORM DISTORTION MEASUREMENTS

Measurement	Range	Accuracy	ITS Element	Standard
Baseline Distortion	50% of bar	± 0.3%	B1	CCIR Rec. 569
2T Pulse/Bar Ratio Error	+25 to –90% (0% nominal)	± 0.5%	B1	CCIR Rec. 569
2T Pulse K-factor	0 to 10% Kf (0% Kf nominal)	± 0.3% Kf	B1	CCIR Rec. 569
Bar Tilt (End Points)	0 to 40% (0%nominal)	0.2%	B2	CCIR Rec. 567
Bar Tilt (Peak-to-Peak)	0 to +40% (0% nominal)	± 0.2%	B2	CCIR Rec. 567
Line Time Distortion	0 to 40% of bar	± 0.2%	B2	CCIR Rec. 560
Bar Tilt (Rec 569)	0 to 40% of bar	± 0.2%	B2	CCIR Rec. 569
Field Time Distortion	0 to 35%	± 0.5%	Field Square Wave	
Chrominance-Luminance Intermodulation	± 50% (0% nominal)	± 0.2%	G1 or G2	CCIR Rec. 569
Luminance Non-linear Distortion	0 to 50% (0% nominal)	± 0.4%	D1	CCIR Rec. 569

LOW FREQUENCY ERROR

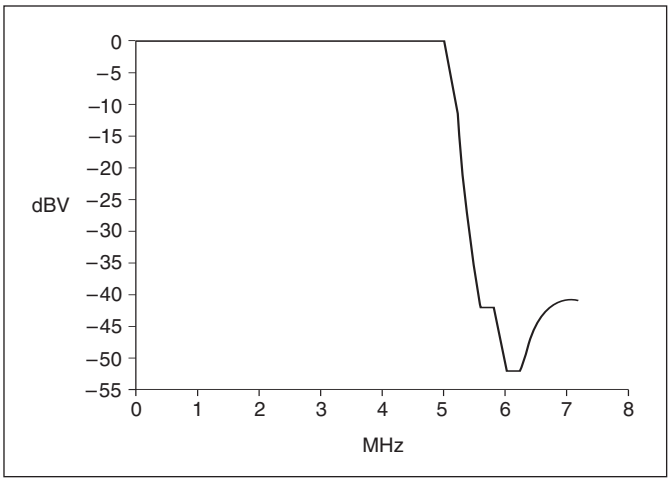
Measurement	Range	Accuracy	Standard
Low Frequency Error (Reported as: CCIR LF Error 50-550 Hz LF Error 10-1000 Hz LF Error)	0% to 25% (0% nominal)	± 0.8%	CCIR Rec. 569

NOISE MEASUREMENTS

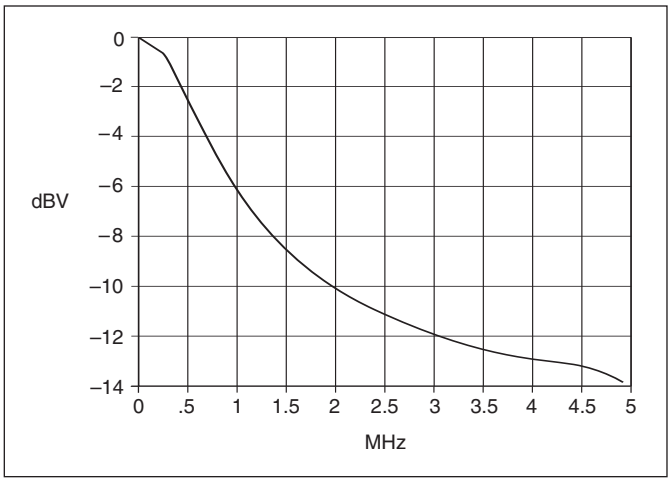
Measurement	Range	Accuracy	Standard
Unweighted SNR (567)	26 to 60 dB 61 to 70 dB	± 1.0 dB ± 2.0 dB	Measured on one quiet line per CCIR Rec. 567
Luminance Weighted SNR (567)	26 to 60 dB 61 to 70 dB	± 1.0 dB ± 2.0 dB	Measured on one quiet line per CCIR Rec. 567
Chrominance Weighted SNR	26 to 60 dB 61 to 70 dB	± 1.0 dB ± 2.0 dB	Measured on one quiet line per CCIR Rep. 637-2
Periodic SNR	26 to 60 dB 61 to 70 dB	± 1.0 dB ± 2.0 dB	Measured on one quiet line per CCIR Rep. 637-2
Unweighted SNR (569)	26 to 60dB 61 to 70 dB	± 1.0 dB ± 2.0 dB	Measured on one quiet line per CCIR Rec. 569
Luminance Weighted SNR (569)	26 to 60 dB 61 tp 70 dB	± 1.0 dB ± 2.0 dB	Measured on one quiet line per CCIR Rec. 569

INCIDENTAL CARRIER PHASE MODULATION

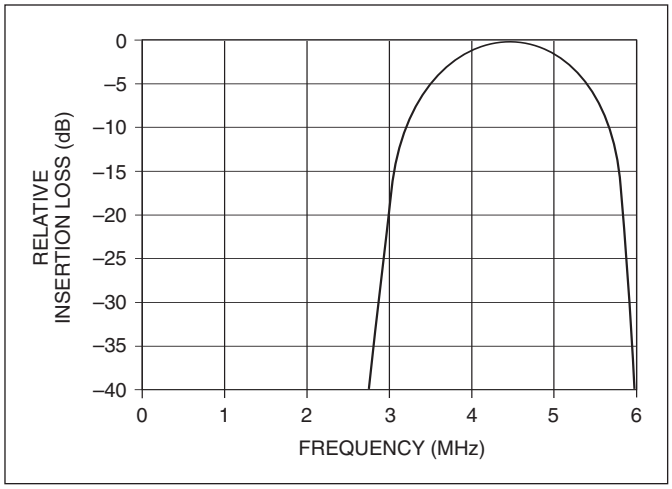
Measurement	Range	Accuracy
ICPM (requires zero Carrier Pulse and the quadrature output of the demodulator on Channel C)	0 to 30 deg.	± 1.0 deg.



Unified Unweighted filter response curve per CCIR Recommendation 567.



Unified Luminance weighted filter response curve per CCIR Recommendation 567.



Chrominance Weighting filter response curve per CCIR Report 637-2.

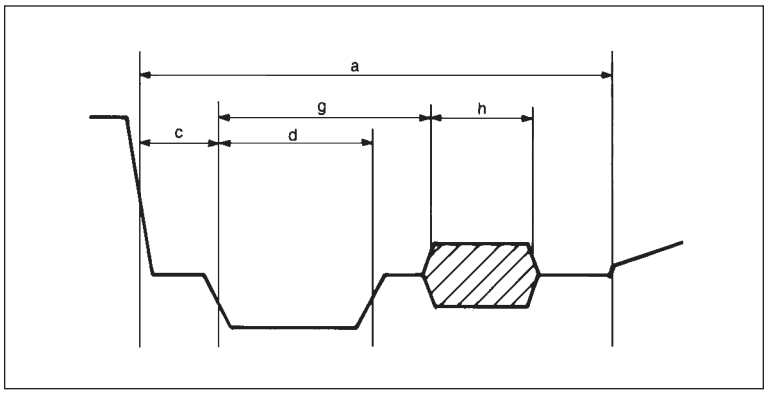
VM700T Video Measurement Set

Channel A System Default 07-Aug-96 19:06:58

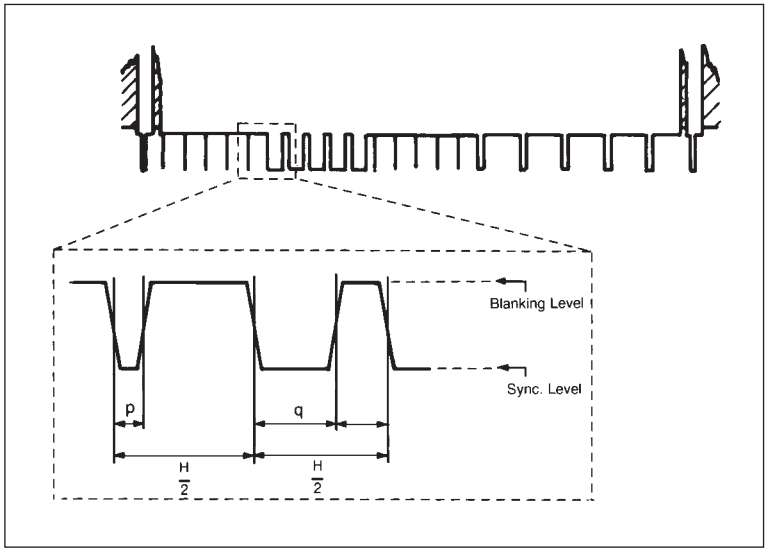
VM700T Video Measurement Set

System Default				*Violated Limits* Lower	Upper	
Source ID	----					Not Found
Luminance Bar Ampl	702.8	mV				
Luminance Bar Ampl	------	% Carr	**	55.0	73.0	No Zero-C Pulse
Lum Bar Ampl Err	0.4	%				
Line Time Distortion	0.1	% Bar				
Bar Tilt (Rec 569)	-0.2	% Bar				
Bar Rise Time	194.5	ns				
Baseline Distortion	-0.1	% Bar				
Blanking Level	------	% Carr	**	69.0	79.0	No Zero-C Pulse
Sync/Bar (Rel 3/7)	100.3	%				
Sync to Bar Top	1004.4	mV				
Pulse/Bar Ratio Err	0.1	% Bar				
2T Pulse K-factor	0.3	% Kf				
C/L Gn Err (Mod Bar)	0.4	% Bar				
Chr/Lum Delay Ineq	4.8	ns				
C/L Gn Err (Mod Pls)	0.8	% Bar				
Lum. Nonlin. Dist.	0.2	%				At 43% APL
Chrom Ref Ampl Err	-0.1	%				
Pk-Pk Diff Gain	0.2	%				At 43% APL
Peak Diff Gain	0.1	%				At 43% APL
Pk-Pk Diff Phase	0.8	Deg				At 43% APL
Peak Diff Phase	0.8	Deg				At 43% APL
Chr/Lum Intermod	-0.0	% Bar				At 43% APL
Sync Amplitude	302.1	mV				
Sync Ampl Error	0.7	%				
Residual Carrier	------	% Carr	**	7.5	15.0	No Zero-C Pulse
Sync-to-Burst Start	5.59	us				
Burst Duration	2.26	us				
Burst Duration	10.0	Cycles				
Burst Amplitude	300.8	mV				
Burst Ampl Error	0.3	%				
Burst Ampl Diff	0.0	%				
Burst Quad Error	-0.1	Deg				
SCH Phase	-2.7	Deg				
Sync Duration	4.70	us				
Sync Rise Time	254.1	ns				
Sync Fall Time	241.9	ns				
Front Porch	1.73	us				
Line Blanking	12.29	us				
Broad Pulse Sep	4.70	us				
Equalizing Pulse	2.35	us				
Multiburst Flag	60.0	% Bar				
Multiburst Flag	422.0	mV				
MB Packet #1	100.2	% Flag				
MB Packet #2	100.6	% Flag				
MB Packet #3	101.0	% Flag				
MB Packet #4	100.1	% Flag				
MB Packet #5	100.0	% Flag				
MB Packet #6	100.4	% Flag				
CCIR LF Error	0.4	% Bar				
50-550 Hz LF Error	0.6	% Bar				
10-1000 Hz LF Error	0.3	% Bar				
S/N Unweighted (567)	67.9	dB				
S/N Lum-wgtd (567)	75.3	dB				
S/N Chr-wgtd	72.5	dB				
S/N Periodic	------	dB	**	40.0	------	Random >> Periodic
S/N Unweighted (569)	68.8	dB				
S/N Lum-wgtd (569)	76.9	dB				
S/N.2 Unwgtd (567)	67.8	dB				
S/N.2 Lum-wgtd (567)	73.6	dB				
S/N.2 Chr-wgtd	72.3	dB				
S/N.2 Unwgtd (569)	68.4	dB				
S/N.2 Lum-wgtd (569)	76.3	dB				
ICPM (Absolute)	------	Deg	**	-20.0	20.0	No Zero-C Pulse
ICPM (Rel Blanking)	------	Deg	**	-20.0	20.0	No Zero-C Pulse
Field Time Dist	------	%	**	-2.0	2.0	Not Found

Measurement results are displayed in an easy-to-read format indicating the time, signal source, measurement, and whether the measured value exceeded caution (*) or alarm (**) limits.



Line Blanking Timing Waveform Measurements.



Field Blanking Timing Waveform Measurements.

Measurement methods

The following paragraphs specify the methods for each Option 11 measurement. Where appropriate, reference is made to the relevant CCIR recommendation.

Line blanking timing measurements

Color Burst Duration: Measured between the half-amplitude points of the burst chrominance envelope. Result expressed as the number of cycles between the half-amplitude points. See duration "h" in waveform diagram. CCIR Report 624-1.

Front Porch Duration: Measured from the half-amplitude point between peak white-level and blanking to the half-amplitude point of the leading edge of sync. See duration "c" in waveform diagram. CCIR Report 624-1.

Line Blanking Interval: Measured from the half-amplitude point between peak white-level and blanking at the front porch to the half-amplitude point between blanking-level and peak white level at the back porch. See duration "a" in waveform diagram. CCIR Report 624-1.

Line Sync Rise and Fall Time (Build-up Times): Measured between the 10% point and the 90% point of the line-synchronizing pulse leading edge (Rise Time) and trailing edge (Fall Time).

Line Sync Width: Measured between the half-amplitude points on the leading edge and trailing edge of sync. See duration "d" in waveform diagram. CCIR Report 624-1.

Sync-to-Start of Burst: Measured from the half-amplitude point of the leading edge of sync to the half-amplitude point of the leading edge of the burst chrominance envelope. See duration "g" in waveform diagram. CCIR Report624-1.

Field blanking timing measurements

Equalizing Pulse Duration: Measured between the half-amplitude points of the leading edge and trailing edge of the equalizing pulse. See duration "p" in waveform diagram. CCIR Report 624-1, Figure 2-1 (a), (b), and (c).

Broad Pulse Duration: Measured between the half-amplitude points of the leading edge and trailing edge of the broad pulse. See duration "q" in waveform diagram. CCIR Report 624-1, Figure 2-1 (a), (b), and (c).

Other timing measurements

Bar Rise Time: Measured between the 10% and 90% points on the leading edge of bar. See element B2.

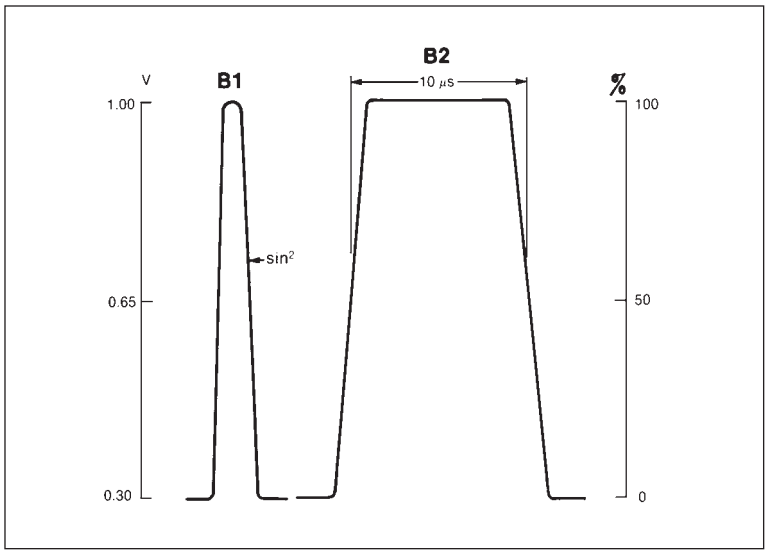
Amplitude and phase measurements

Sync Amplitude Error: Measured as the difference between the sampled sync pulse amplitude and a nominal 300 mV amplitude. Result expressed as a % of the nominal 300 mV. Sign is positive if the sampled sync pulse amplitude is greater than 300 mV.

Burst Amplitude Error: Measured as the difference between the sampled peak-to-peak amplitude at the center of burst and a nominal 300 mV amplitude. Result expressed as a % of the nominal 300 mV amplitude. Sign is positive if the sampled peak-to-peak burst amplitude exceeds 300 mV.

Chrominance Reference Amplitude Error: Measured as the difference between the sampled peak-to-peak amplitude of the blanking-level chrominance packet and the normalized value (0.4 of the measured bar amplitude). Result expressed as % of the normalized value. Sign is positive if the sampled peak-to-peak amplitude exceeds 280 mV. See element D2 and CCIR Recommendation 569.

Luminance Bar Amplitude Error: Measured as the % deviation of the sampled bar amplitude from a nominal value of 700 mV. Sign is positive if the sampled bar amplitude exceeds 700 mV. See element B2 and CCIR Recommendation 569.



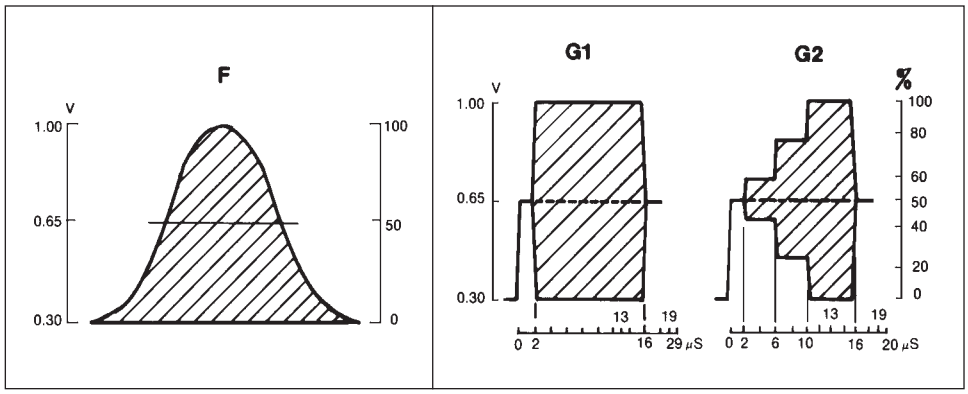
Elements B1 and B2 (CCIR Recommendation 567).

Luminance Bar Amplitude: The absolute amplitude of sampled bar. Result expressed as mV and % of Carrier (if Carrier is present). See element B2.

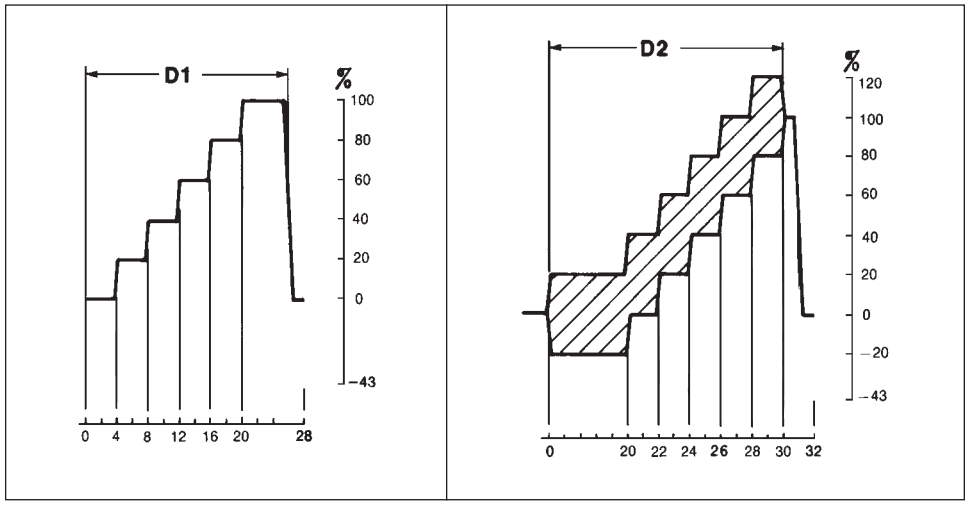
Bar Tilt Error: Measured as the maximum departure of the bar top from the sampled bar amplitude at bar center, excluding the bar portion one microsecond past the bar leading edge half-amplitude point and one microsecond before the bar trailing edge half-amplitude point. The sign of the difference is always positive. Result expressed as a % of sampled bar amplitude. See element B2 and CCIR Recommendation 567.

Blanking Level: Measured as the mean level over 32 sampled lines of 16 samples centered around the back porch. Result expressed as % of Carrier. Not measured if Carrier not present in the vertical interval.

2T Pulse K-factor: Measured as the greatest weighted amplitude of a positive-going or negative-going echo-term half-wave which is within one microsecond before the 2T pulse leading edge half-amplitude point or within one microsecond after the 2T pulse trailing edge half-amplitude point. Result expressed as a K-factor, which is the ratio of the weighted amplitude of the echo-term half-wave to the sampled amplitude of the 2T pulse. The weighting is based on the graticule shown in Figure 29a of CCIR Recommendation 567. See element B1.



Element F, G1, and G2 (CCIR Recommendation 567).



Element D1 and D2 (CCIR Recommendation 569).

C/L Gain Inequality: Measured as the difference between the sampled peak-to-peak amplitude of the 700 mV (nominal) chrominance packet (G1 or G2) and the sampled amplitude of the luminance bar (also nominally 700 mV). Result expressed as a % of sampled bar amplitude. Sign is positive if the chrominance amplitude is greater than the luminance amplitude. See element G1 or G2 and CCIR Recommendation 569.

C/L Delay Inequality: Measured as the time-difference between the 10T or 20T composite pulse chrominance component center and the composite pulse luminance component center. Result expressed in nanoseconds. The sign of the result is positive if the chrominance component lags the luminance component. See element F and CCIR Recommendation 569.

C/L Intermodulation: Measured on a 350 mV pedestal, part of which has had chrominance packet superimposed and part of which has not. The result is the difference between the pedestal level under the chrominance packet after the chrominance has been filtered out and the pedestal level where no chrominance pedestal was superimposed. Result expressed as a % of sampled bar amplitude. Sign is positive if the level of the pedestal which was under the chrominance is greater than the other level. See element G1 or G2 and CCIR Recommendation 569.

Differential Gain: Measured as peak-to-peak differential gain. The 5-riser staircase chrominance packet with the greatest peak-to-peak amplitude is found and the ratio of that amplitude to the peak-to-peak amplitude of the blanking level chrominance packet is determined and subtracted from unity. A similar ratio is determined using the packet with the least peak-to-peak amplitude and that ratio is subtracted from unity. The measurement result is the sum of the two differences. See element D2 and CCIR Recommendation 569.

Differential Phase: Measured as peak-to-peak differential phase. The maximum phase difference (absolute value) between a 5-riser staircase chrominance packet and the blanking-level chrominance packet is determined. Likewise, the minimum phase difference (absolute value) is determined. The measurement result is the sum of these two phase differences and is expressed in degrees. See element D2 and CCIR Recommendation 569.

Luminance Non-linear Distortion: Measured by comparing the differences between adjacent pairs of the six luminance levels that make up the 5-riser staircase. The measurement result is the largest % deviation in adjacent step sizes. The sign is always positive. See element D1 and CCIR Recommendation 569.

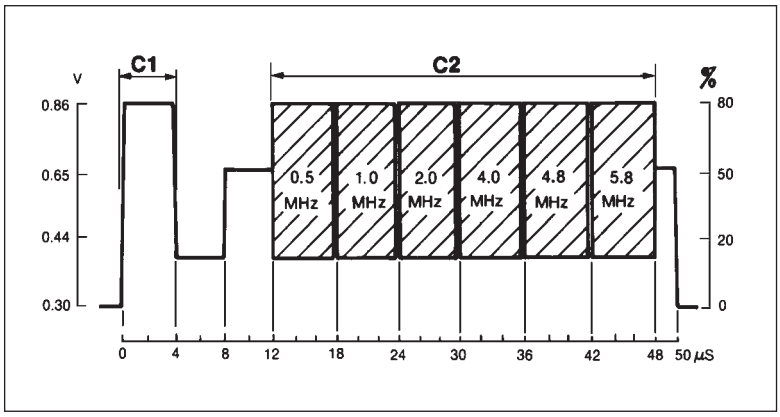
Frequency response measurements

Multiburst Flag Amplitude: Measured from the center point of the flag top to the ensuing bottom of the flag. Result expressed as % of sampled bar amplitude. See element C1 and CCIR Recommendation 567.

Multiburst Amplitude (five packets): Measured as the peak-to-peak amplitude of each of the first five multiburst packets. The peak-to-peak amplitude is measured over a 4.5 µsec window at the center of the first two packets, and over a 1.13 µsec window at the center of the next three packets. The last packet is not measured. Results expressed as % of sampled flag amplitude. See elements C1 and C2 and CCIR Recommendation 567.

Linear waveform distortion measurements

Baseline Distortion: Measured as the difference between the signal level 400 nanoseconds after the half-amplitude point of the trailing edge of the bar, and the signal level at blanking reference. The signal is first band-limited to 3.3 MHz. Result expressed as a % of sampled bar amplitude. Sign is positive if level nearest bar is highest. See CCIR Recommendation 569 (paragraph 2.4) and Figure 1.



Elements C1 and C2 (CCIR Recommendation 569).

2T Pulse/Bar Ratio Error: Measured as the difference between the sampled amplitude of the 2T pulse and the sampled bar amplitude. The sign is positive if the 2T pulse amplitude is greater. Result expressed as a % of sampled bar amplitude. See elements B1 and B2 and CCIR Recommendation 569.

Low frequency error

Low Frequency Error: Measured as the peak-to-peak amplitude of the most extreme sampled fluctuations from black-level that are in the frequency band between 10 Hz and 2 kHz. Expressed as a % of sampled bar.

Ordering Information

When ordering, please use the nomenclature given here. The standard instrument is shipped as a rack mount product.

VM700T
Option 11

PAL Video Measurement Set.

Included Accessories

Instruction manual; 75 Ω terminators (3) 011-0102-00; power cord.

Options

Option 01 — NTSC Measurements
Option 01/11 — Dual Standard Measurements
Option 20 — Teletext Measurements
Option 21 — Camera Measurements
Option 30 — Component Measurements
Option 40 — Audio Measurement Module
Option 41 — 6 Channel Audio Measurement Module
Option 42 — Audio to Video Delay Measurement
Option 48 — GPIB Interface
Option 1C — Cabinet Version
Option 1G — Echo/Rounding Measurements
Option 1P — Printer
Option 1Z — Probe Adapter (067-1429-00)
Option 3Z — Probe Adapter (3 each of 067-1429-00)

VM700T Software Utilities

VMBKUP — VM700T Backup Utility
VMREMGR — Remote Graphics Software for the VM700T
VMT — VM700T Remote Control Software

Optional Accessories

VM7FC1 — Field installable conversion kit to convert rackmount unit to cabinet.
VM7FR1 — Field installable conversion kit to convert cabinet to rackmount unit.

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